JOINT ENVIRONMENTAL ASSESSMENT FOR THE WEST ELK HILLS 3D SEISMIC SURVEY (OFF-UNIT PROPERTIES) AT OCCIDENTAL OF ELK HILLS, INC. KERN COUNTY, CALIFORNIA

Prepared for:

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BAKERSFIELD FIELD OFFICE

U. S. DEPARTMENT OF ENERGY
NAVAL PETROLEUM RESERVES IN CALIFORNIA

Prepared by:

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July 1999

ENVIRONMENTAL ASSESSMENT

FACE SHEET

Title of Project: **WEST ELK HILLS 3D SEISMIC SURVEY**

EA Numbers: BLM CA-160-99-063; DOE: EA-1304
BLM Case file/Serial Number:

Preparing Office: Bakersfield Field Office

Project Leader: Larry Saslaw Title: Wildlife Biologist

LIST OF PREPARERS:

POSITION	SIGNATURE
1. WILDLIFE	_____
2. BOTANY	_____
3. CULTURAL RESOURCES	_____
4. RANGE	_____
5. MINERALS	_____
6. RECREATION (Wilderness, Visual Resources)	_____
7. LANDS (Use Authorizations, Land Tenure Adjustment)	_____

Project Leader: _____

Signature Date

DECISION RECORD

EA NO.: CA-160-99-063

STATE: California
FIELD OFFICE: Bakersfield

PROJECT: WEST ELK HILLS 3D SEISMIC SURVEY

1. ENVIRONMENTAL COMPLIANCE

We have reviewed the environmental document, which analyzes the environmental effects of the proposed action, and have determined that the proposed action and recommended mitigation measures result in a finding of no significant impact on the human environment. We find that proper consideration has been given to all resource values and that this assessment is technically adequate. Therefore, an environmental impact statement is not required to further analyze the environmental effects of the proposed action.

Reviewed By:

_____ _____
Project Lead, Bakersfield Field Office Date

_____ _____
Chief, Branch of
Resources, Bakersfield F.O.
Date

2. DECISION

I have reviewed the recommendations on the proposed action addressed in this environmental assessment. I find this action to be in conformance with applicable land use plans, that it effectively serves the public, and that it will not cause unnecessary or undue degradation. It is therefore my decision to approve the proposed action, subject to the mitigation measures identified for the proposed action in the Environmental Assessment and Elk Hills Section 7 Biological Opinion. The Decision Record incorporates the mitigation measures and recommendations into the proposed action as the decision of the Bureau on this matter.

Approved By:

_____
Authorized Officer, Bakersfield F.O. Date

ENVIRONMENTAL ASSESSMENT
PROJECT: WEST ELK HILLS 3D SEISMIC SURVEY

LOCATION: The proposed seismic survey targets the western portion of the Occidental

of Elk Hills, Inc., (OXY) lands formerly known as NPR-1, Kern County, California. Project activities are planned to occur on partial or whole sections of land within OXY holdings, and adjacent Bureau of Land Management (BLM), U.S. Department of Energy (DOE), and privately held lands within the Mount Diablo baseline and meridian (MDBM). This environmental assessment addresses only the lands located off OXY holdings. A separate Biological Opinion and Supplemental Environmental Impact Statement covers lands now held by OXY, per the sale agreement between the DOE and OXY.

The Area of Potential Effect (APE) located off OXY lands includes all or portions of the following sections:

T30S, R22E, Sections 1, 2, 3,10, 11, 13, 15, 22, 23, 25, 26, 27, 34, 35, 36
T30S, R23E, Sections 1, 2, 3, 4, 5, 6, 9, 11, 31
T31S, R22E, Sections 1, 2, 3, 11, 12, 13
T31S, R23E, Sections 5, 6, 7, 8, 9, 15, 16, 17, 18, 19, 20, 21, 22, 23

Also see attached project map (Figure 2) of proposed Area of Potential Effect (APE).

DATE INITIATED: March 4, 1999

AFFECTED SURFACE AREA
OFF ELK HILLS: 24,800 acres

BLM Mineral & Surface Acres: 3,440 acres
BLM Mineral Only Acres: 1,920 acres
Private Acres: 17,200 acres
U.S. Department of Energy
(NPR-2): 2,240 acres

LAND STATUS VERIFIED: YES X NO

CARRIZO: YES X NO WSA NO.: NONE ACEC (NAME): LOKERN NATURAL AREA

7.5 MINUTE QUAD NAMES: Tupman, East Elk Hills, Taft, and Mouth of Kern

CONFORMANCE WITH APPLICABLE LAND USE PLAN

The proposed action falls within the scope of the Caliente Resource Management Plan (RMP), approved in May 1997. This plan has been reviewed to determine if the proposed action conforms with the land use plan, terms, and conditions as required by 43 CFR 1610.5-3(a).

One management objective for the Valley Management Area is to Acollaborate with oil and gas and livestock industries in meeting mutually beneficial management objectivesA. The RMP also directs the Bureau to Amanage public lands to provide healthy, sustainable, biologically diverse ecosystems contributing goods, services and other social and cultural needs for local communities, the region and nation". The BLM accomplishes these objectives through standard practices that include environmental reviews of proposed actions by an interdisciplinary team. This team reviews the action in conformance with the existing planning base (law, executive order, regulation, policy and land use plans) and the National Environmental Policy Act (NEPA). The interdisciplinary team also develops mitigation measures that can be taken to reduce or eliminate potential impacts. There are five general categories of mitigation:

1. Avoiding the impact by not taking certain actions or parts of actions,
2. Minimizing the impacts by limiting the degree or magnitude of the action and its implementation,
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment,
4. Reducing or eliminating the impact over time, and
5. Compensating for the impact by replacing or providing substitute resources or environments.

The design and implementation of this proposed action incorporates several of these categories of mitigation.

Management Area Land Decisions for Minerals states:

1. Exploration activities conducted under a Notice of Intent will be allowed within Special Category Areas in a manner that will not impact resources legally mandated for protection and rehabilitation is such that the impact of the exploration activities is negligible.

All other areas will be managed to encourage exploration operations in a manner that recognizes sound reclamation practices, within guidelines and constraints of pertinent federal, state, and local laws, regulations, and orders.

RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER PLANS:

Endangered Species Act (ESA) of 1973 (as amended)

National Environmental Policy Act (NEPA) of 1969
California Environmental Quality Act (CEQA)
BLM Caliente Resource Area Resource Management Plan
California Endangered Species Act of 1980
National Historic Preservation of 1966, as amended (36 CFR Part 800)
Archeological Resource Protection Act of 1979 (43 CFR Part 7)
Native American Graves Protection and Repatriation Act of 1990 (43 CFR Part 10)
American Indian Religious Freedom Act of 1978
Protocol Agreement Between BLM/SHPO/ACHP (April 6, 1998)

Table of Contents

	Page
ENVIRONMENTAL ASSESSMENT	i
CONFORMANCE WITH APPLICABLE LAND USE PLAN	ii
TABLE OF CONTENTS	iii
RELATIONSHIP TO STATUTES, REGULATIONS AND OTHER PLANSY	iv
LIST OF FIGURES	v
LIST OF TABLES	v
LIST OF APPENDICES	v
TABLE OF ACRONYMS AND ABBREVIATIONS	vii
SUMMARY	viii
INTRODUCTION	1
1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION	3
2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION	3
2.1 ALTERNATIVE 1 (NO-ACTION)	3
2.2 ALTERNATIVE 2 (PROPOSED ACTION)	3
2.3 ALTERNATIVE 3 (REDUCED AREA OPTION)	10
2.4 ALTERNATIVE 4 (DRILL ONLY/REDUCED SPACING) 10	
3.0 AFFECTED ENVIRONMENT/ENVIRONMENTAL IMPACTS OF THE PROPOSED AND ALTERNATIVE ACTIONS	11
3.1 NO-ACTION ALTERNATIVE 11	
3.2 THE PROPOSED ACTION AND THE REDUCED AREA OPTION 11	
3.2.1 Air Quality	11
3.2.2 Water Resources	12
3.2.3 Geology and Soils	12
3.2.4 Land Use	12
3.2.5 Waste Management	13
3.2.6 Ecology 13	

TABLE OF CONTENTS, CONTINUED

3.2.7 Floodplain and Wetlands 15
3.2.8 Socioeconomic 15
3.2.9 Cultural Resources 16
3.2.10 Visual Resources 16
3.2.11 Noise 16
3.2.12 Occupational Health and Safety 17
3.3 CUMULATIVE IMPACTS 18
3.4 SUMMARY OF IMPACTS 18
4.0 LIST OF AGENCIES AND PERSONS CONSULTED 21
5.0 REFERENCES 22

LIST OF FIGURES (NOTE: Figures not available electronically)

FIGURE 1 REGIONAL LOCATION MAP 2
FIGURE 2 PROPOSED SITE LOCATION MAP 4

LIST OF TABLES

TABLE 1 SUMMARY OF SOURCE POINT LOCATIONS FOR ON-SITE AND OFF-SITE PORTIONS OF THE PROJECT**YYYY** 5
TABLE 2 STANDARD SETBACK DISTANCES FOR SHOTPOINT PLACEMENT 8
TABLE 3 SUMMARY OF IMPACTS 18

TABLE A -1.1 AVOIDANCE CRITERIA A-1

TABLE OF CONTENTS, CONTINUED

LIST OF APPENDICES (NOTE: Appendices B thru E are not available electronically)

APPENDIX A MITIGATION MEASURES AND RESIDUAL IMPACTS

APPENDIX B U.S. FISH AND WILDLIFE SERVICE/CALIFORNIA DEPARTMENT OF FISH AND GAME CONSULTATION BIOLOGICAL OPINION AND CDFG MOU

APPENDIX C STATE HISTORIC PRESERVATION OFFICER COORDINATION

APPENDIX D PRELIMINARY SEISMIC SURVEY DESIGN PARAMETERS

APPENDIX E PUBLIC COMMENTS

TABLE OF ACRONYMS AND ABBREVIATIONS

3 D	3 Dimensional
APE	Area of Potential Effect
ATV	All Terrain Vehicle
BLM	U.S. Bureau of Land Management (Department of Interior)
BPOI	Bechtel Petroleum Operations, Inc. - Past Unit Operator of NPR-1
CDFG	California Department of Fish and Game
CGG	CGG Land Seismic, Inc.
CO	Carbon Monoxide
OXY	Occidental of Elk Hills, Inc.
DOE	U.S. Department of Energy
DPI	Discounted Profitability Index
EIS	Environmental Impact Statement
FWS	U.S. Fish and Wildlife Service (Department of Interior)
NAAQS	National Ambient Air Quality Standards
NOX	Oxides of Nitrogen
NPR-1	Naval Petroleum Reserve No. 1
NPR-2	Naval Petroleum Reserve No. 2
NPRC	Naval Petroleum Reserves in California
NPV	Net Present Value
NRHP	National Register of Historic Places
PM10	Particulate Matter less than 10 microns
ppm	parts per million
SEIS	Supplemental Environmental Impact Statement (DOE/SEIS/PEIR-015852) for Petroleum Production at Maximum Efficient Rate, Naval Petroleum Reserve No. 1 (Elk Hills), Kern County, California
SHPO	State Historic Preservation Officer
SJVUAPCD	San Joaquin Valley Unified Air Pollution Control District
SOX	Oxides of Sulfur
SPCC	Spill Prevention, Control, and Countermeasure Plan
TDS	Total Dissolved Solids
VOC	Volatile Organic Compounds

Summary

BACKGROUND AND PURPOSE

Occidental of Elk Hills, Inc. (hereafter referred to as OXY) proposes to conduct a seismic survey to develop a three-dimensional map of the geologic strata under Elk Hills to identify potential natural gas and oil resources. This survey (hereafter referred to as the West Elk Hills 3D Seismic Survey) will be used to determine the extent of natural gas or oil reserves present and whether such resources warrant development of additional production wells. This project is to be conducted by CGG Land Seismic, Inc. (CGG) for OXY. Approval is required from the U. S. Bureau of Land Management (BLM) and the U.S. Department of Energy (DOE) to conduct the survey on federal lands located off of Elk Hills. In accordance with Section 7(a)(2) of the federal Endangered Species Act (ESA), in 1991, the DOE prepared a Biological Assessment to initiate formal consultation with USFWS on the effects of continued petroleum production on Naval Petroleum Reserve No. 1 (now Elk Hills), on listed species. The resultant non-jeopardy Biological Opinion rendered by USFWS on November 8, 1995 (U.S. Department of the Interior, 1995) was subsequently assumed by OXY upon acquisition of the federal holdings on Elk Hills. The 1995 Opinion provides incidental take authorization for proposed project activities occurring within the boundaries of Elk Hills. A Supplemental Environmental Impact Statement (SEIS) also was prepared in accordance with the National Environmental Protection Act (NEPA), as required. The final SEIS was completed in July, 1993. In addition, SEIS (PEIR-0158-S2) was completed in October 1997 to support the Sale of Naval Petroleum Reserve No. 1. The activities associated with the West Elk Hills 3D Seismic Survey that are proposed for on Elk Hills are covered by these two three documents. Consequently, this environmental assessment and other supporting documentation are being prepared to evaluate the effects of the proposed project on lands adjacent to, but outside of the boundaries of Elk Hills only. The survey is scheduled to begin in early July 1999 and is expected to conclude in February 2000.

PROPOSED ACTION

The survey will be conducted along approximately 49 source line transects (1,100 foot spacing) across portions of Elk Hills and surrounding areas. Transects in a high effort area on Elk Hills will include additional infill source lines resulting in a transect spacing of 550 foot spacing. The survey will be conducted using helicopters and ground crews to deploy seismic detectors (geophones) connected to seismic cable (receiver lines). Shotpoints or vibroseis buggies will be used as seismic sources. Seismic sources will be detonated (shot), or generated by buggy-mounted vibroseis units, at source points centered within an electrically active portion of ten to twelve receiver lines. The receiver line at the north edge of the survey area will be relocated to the south as the project progresses so that ten to twelve receiver lines are active at any time.

ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the proposed action include (1) no action, (2) a reduced area action, and (3) drill only/reduced spacing option. The reduced area option may be necessary if the project is selected and necessary access is not granted to non-OXY lands needed for the full fold seismic survey.

EXISTING ENVIRONMENT/IMPACTS OF THE PROPOSED ACTION

The OXY site (formerly NPR-1) comprises 47,409 acres (74 square miles) within the Elk Hills, a long, narrow ridge about 16 miles long by 6 miles wide, oriented generally northwest to southeast in the southern San Joaquin Valley (Figure 1), approximately 25 miles west of Bakersfield, California. Significant hydrocarbon reserves exist at Elk Hills and are produced under a Unit Plan Contract between OXY and Chevron USA. Most of the oil field development has occurred in upland areas of the site with lower, flatland areas on the periphery remaining comparatively undeveloped.

OXY and the adjacent properties support a diverse variety of flora and fauna. Among those species that may be impacted by the proposed action are five federally listed threatened/endangered species (San Joaquin kit fox, giant kangaroo rat, Tipton kangaroo rat, blunt nosed leopard lizard, and Hoover's woolly star) and one state listed threatened species (San Joaquin antelope squirrel). The primary environmental impacts caused by the proposed action would be temporary surface disturbance associated with drilling of shotholes, placement of vibroseis pads, geophone placement, and vehicle ingress/egress to and from off-road drilling and vibroseis locations. Prior to initiation of the seismic survey, a biological survey will be performed to locate endangered species in the area. Any areas where endangered species are found will be marked for avoidance and/or mitigation in the ensuing activities. Additionally, revegetation, reduced vehicle speed limits, and on-site monitoring are planned to mitigate any detrimental impacts on listed species.

The San Joaquin Valley Air Basin portion of Kern County is a nonattainment area for federal and state limits on ozone, and is a serious nonattainment area for particulate matter of 10 microns or less (PM10). Vehicle use is expected to be the only source of emissions of ozone precursors or PM10 in the proposed action. Ozone concentrations will not be significantly affected by the proposed action due to the small number of vehicles (3-6 drill buggies and 4-6 vibroseis buggies) required for the survey. In addition, a helicopter will be used to transport portable drills in steep terrain areas where access is difficult. However, PM10, or dust emissions, are expected during project operations, but will be minimized by reduced speed limits.

A cultural resources records search will be conducted at San Joaquin Valley Information Center, California State University, Bakersfield, to identify previously recorded archaeological sites occurring within the area of potential effect (APE). However, until precise seismic source and receiver line locations are identified on the ground, a determination cannot be made as to whether any previously recorded and unnrecorded cultural resources will be impacted by the seismic activities.

INTRODUCTION

Occidental of Elk Hills, Inc. (OXY) oilfield, previously known as the Naval Petroleum Reserve No. 1 (NPR-1) oil field, was created by an executive order issued by President William H. Taft on September 2, 1912. Except for a period between 1921 and 1927, when the Reserve was assigned to the Department of the Interior, management of NPR-1 was vested in the Secretary of the Navy until 1977. Other than brief periods when the Reserve was opened for testing or defense purposes, the facility was maintained in a reserve shut-in status until 1976. Following open-up in 1976, NPR-1 production was managed at the maximum efficient rate (MER), pursuant to the Naval Petroleum Reserves Production Act of 1976 (Public Law 94-258), which was passed as the result of oil shortages in the 1970s. Until February 5, 1998, management was under the authority of the Secretary of Energy pursuant to the Department of Energy (DOE) Organization Act (Public Law 95-91). Since open-up in 1976, NPR-1 had been operated under a management-and-operations contract, which was held most recently by Bechtel Petroleum Operations, Inc. (BPOI). Public Law 94
258 was amended with enactment of the National Defense Authorization Act for Fiscal Year 1996 on February 10, 1996 (Public Law 96-104-106) (110 Stat. 186). Title 34 of the National Defense Authorization Act for Fiscal Year 1996 called for sale of NPR-1 within two years of the date of enactment. Sale of NPR-1 was completed, with Occidental Petroleum, Inc., as the successful bidder. The oil field is now owned by OXY and Chevron, U.S.A., and is operated by OXY.

The OXY site (hereafter referred to as Elk Hills), comprises 47,409 acres (74 square miles). It lies within the Elk Hills formation, a long, narrow ridge about 16 miles long by 6 miles wide, oriented generally east-west in the southern San Joaquin Valley (Figure 1). Elk Hills contains production development at various levels in 90% of the 78 sections that lie partially or entirely within its civil boundaries. Within the boundaries of Elk Hills, Chevron U.S.A. (CUSA) owns 10,360 acres (about 22%), and the remaining 37,049 acres are owned by OXY (about 78%). Petroleum production operations at Elk Hills are conducted under a Unit Plan Contract (UPC) that became effective in February 1998. Elk Hills is surrounded on three sides by extensively developed oil and gas fields that have been in production since the early 1900s. Extensively developed agricultural lands lie to the north and northeast of Elk Hills. Naval Petroleum Reserve No. 2 (NPR-2) is south of Elk Hills and shares a common border with Elk Hills. NPR-2 consists of approximately 30,181 acres, 10,446 acres of which are owned by the U.S. government and have been developed under lease to private oil companies since the 1920's. The other 19,735 acres are currently owned by private oil companies. NPR-2 government lands remain under the jurisdiction of, and are administered by DOE, and constitute what is now known as Naval Petroleum Reserves in California (NPRC).

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

The proposed action is designed to provide seismic data for analysis of subsurface geology in west Elk Hills with the goal of better defining the commercial limits of currently producing reservoirs and the extent of possible new resources. Interpretation of data is

expected to provide OXY with more accurate locations of structural highs, faults, and pinch outs to maximize recovery of available hydrocarbon resources in western Elk Hills. Completion of this project is expected to increase Elk Hills recoverable reserves, and reduce risks and costs associated with further exploration and development in the area.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 ALTERNATIVE 1 (NO-ACTION)

Under this alternative, the proposed West Elk Hills, 3D Seismic Survey would not be performed and the opportunity to obtain needed geological information would be foregone.

2.2 ALTERNATIVE 2 (PROPOSED ACTION)

OXY proposes to conduct seismic investigations within Elk Hills and within an area of 1-4 miles outside the northern, southern and western portion of Elk Hills, Kern County, California. OXY's seismic contractor will be CGG Land Seismic, Inc. (CGG). In general, the proposed seismic testing includes the use of articulating vibroseis units and drilled bore holes containing explosives (shotholes) as seismic energy sources along pre-determined source lines.

The proposed West Elk Hills 3D Seismic Survey encompasses approximately 76 sections (Figure 2) and covers approximately 44,800 acres (17,200 acres of private lands, 20,000 acres of previous Department of Energy owned lands within Elk Hills (NPR-1) currently owned by OXY, 5,360 acres of land administered by BLM, and 2,240 acres of land owned by the DOE (NPR-2) in western Kern County, California. The project is approximately 8.5 miles east to west and 10 miles north to south, at the widest portion of the prospect area.

This environmental assessment addresses those portions of the proposed seismic survey that lie outside of OXY land holdings (Elk Hills). This area comprises approximately 44 sections of the total 76-section seismic survey area. This proposed action falls within the scope of the Supplemental Environmental Impact Statement, Petroleum Production at Maximum Efficient Rate, Naval Petroleum Reserve No. 1 (Elk Hills), Kern County, California (July 1993) which included 3,390 acres of impacts off Elk Hills. In addition, *Supplemental Environmental Impact Statement/Program Environmental Impact Report for the Sale of NPR-1, Sale of Naval Petroleum Reserve No.1 (Elk Hills), Kern County, California (October 1997)* also states that AGeophysical surveys would affect approximately 226 acres per year (both on and off NPR-1 sites)@. The US Fish and Wildlife Service (FWS) has determined that this project falls within the project description of this EIS and the Biological Opinion conducted between the Department of Energy and FWS for that document (Peter Cross, pers. com.). This project will be subject to all mitigation, take avoidance measures, term and conditions, and take authorizations included in that Biological Opinion unless otherwise approved by the FWS.

All project related activities will be confined to existing roads and trails where possible. Cross country travel will occur only where roads and trails are not available, where sensitive

resources can be avoided by vehicles within the 25-foot seismic activity corridor, and where no listed resources occur within agency avoidance criteria. All pin flags, flagging, and trash will be collected daily as the project progresses. Areas with significant disturbance will be reclaimed to as close to original conditions as feasible. USFWS and BLM standard mitigation measures shall apply and are included in this assessment.

2.2.1 Project Set-Up

The West Elk Hills 3D Seismic Survey will be conducted by establishing a temporary grid of seismic detectors on approximately 51 parallel receiver lines across Elk Hills and adjacent properties. Additional infill receiver lines will be added in the high effort area on Elk Hills. The detectors, called geophones, will be connected to receiver lines which are in turn coupled to recording instruments to transmit data. Receiver lines will be oriented north to south, will be a maximum of 10 miles in length, and will be spaced 880 feet apart in the low effort areas (off-site) and 440 feet apart in the high effort areas inside the Elk Hills Unit. The combined length of the receiver lines for the entire prospect is approximately 596 miles. The seismic cable used for receiver lines is a 3/8-inch diameter insulated cable in connecting segments. Each cable segment is approximately 720 feet long. Each receiver cable has three geophone receptacles (take outs). A group of six to twelve geophones plugs into each take out. Each 10 mile long receiver line uses approximately 73 cables hooked together and has between 1,314 to 2,628 geophones at 219 take outs.

Source lines will be oriented east and west. These source lines will be a maximum of 8.5 miles long (perpendicular to receiver lines) and spaced at 550 foot intervals in the high effort area on Elk Hills and 1,100 foot intervals in the low effort area (primarily off Elk Hills). Seismic sources will be generated by explosives or vibroseis. There will be approximately 473 miles of source lines within the prospect area. A 110-foot spacing will be used for source points along these source lines. As indicated in the following table, a total of 22,691 source points will be used during this project.

TABLE 1
Number of source point locations for on-site/off-site portions of the project.

Portion of Project	Type of Habitat	No. of Source Points
High Effort Area	Undisturbed areas.	12,795
(includes most of Elk Hills)	Roads/previously disturbed areas (10%).	1,422
	Subtotal (On Elk Hills):	14,217
Low Effort Area	Undisturbed areas.	7,627
(primarily off Elk Hills)	Roads/previously disturbed areas (10%).	847
Subtotal (Off Elk Hills):		8,474
Total No. of Source Points:		22,691

The number of source points in Table 1 is only a preliminary estimate. Depending on the

analysis of the data from the East Elk Hills 3D Seismic Survey, there may be additional high effort areas identified off Elk Hills within the prospect area.

This layout description pertains to the entire prospect. Approximately 44 sections of the 76 sections included in the entire seismic survey lie outside of OXY landholdings. This environmental assessment addresses the 44 sections outside of OXY holdings.

2.2.2 Deployment of Receiver Lines

Receiver equipment will be transported to the field or to helicopter landing sites and staging areas by truck. The location of helicopter landing sites will vary as receiver lines are moved and the proposed survey progresses. The specific location of each landing site will be determined in the field after appropriate biological avoidance criteria are satisfied. Sufficient equipment to lay out six detectors and two lengths of seismic cable will be placed into nylon cache bags at helicopter landing sites and will be flown to drop sites four bags at a time using a long line suspended from the helicopter. The helicopter will operate at an altitude of approximately 50 feet and will deploy one bag at a time along receiver line routes with direction from the ground crew. One to two helicopters will be used for this project.

Ground crew members will walk to bags and manually connect cables and related equipment at proper detector (geophone) stations. Seismic cable will be laid out by hand as crew members walk from detector station to detector station. Deployment of seismic cable may include the use of all-terrain-vehicles (ATVs) in some instances. At each station, crew members will place geophones in a pre-determined pattern. A geophone consists of a 2-inch diameter casing with a 4-inch metal spike that protrudes from the bottom of the casing. All geophones will be placed into the soil using foot pressure. The detector geophones and seismic cable will be laid out in this manner across all portions of the project. After a portion of the seismic survey is completed, geophones and seismic cable will be retrieved in the same manner and moved to a new location.

Ten to twelve adjacent receiver lines of detectors and seismic cable will be laid out at any time. A recording truck containing data collection equipment will be parked at a convenient location, such as an oil field road, and connected to receiver lines. As the project proceeds, the last receiver line will be picked up and moved by helicopter or truck to the front of the project and re-deployed. As a result, there will always be ten to twelve receiver lines in place. The receiver line deployment will proceed in this manner from one end of the project to the other throughout the project to its completion. This approach is referred to as a roll-on, roll-off system.

2.2.3 Source Lines

The source of energy required to conduct the shot hole portion of this survey will be supplied by explosives placed in "mini-holes" 30 feet deep or generated by buggy-mounted vibroseis units. Articulating-buggy mounted drills, ATV mounted drills, or helicopter-portable (tripod) drills will be used to drill 3-inch diameter holes to a depth of 30 feet. A 3.0 to 6.0-pound charge of high-velocity explosive will be placed into each hole. Two electrical blasting caps will be attached to the charge. The hole will be plugged with drill cuttings and filled to ground level with topsoil.

Where weather conditions make continued drilling of holes infeasible, drilling will be discontinued and activities will be relocated to drier areas within the project area. Drilling activities in discontinued areas will resume when soil moisture conditions allow. Table 2 indicates setback distances for shotpoints from various cultural and natural features. No explosives will be placed or used within the setback areas.

Where vibroseis equipment is used four to six articulated buggy mounted vibroseis units spaced 2-5 ft apart will proceed in single file along source lines producing seismic source energy near the source points. The lead vibe buggy will stop one buggy length past the source point, all buggies will lower their pads and vibrate for a pre-determined length of time before moving forward approximately 7.5 ft to repeat the process. Each buggy will lower its pad and vibrate a pre-determined number of times at a source point. Pads on the units are 7 ft wide and 3.5 ft long, thus the collective vibe pad depression at each source point has potential to be 0-6 inches deep, 7 ft wide, and 110 ft long. After completing vibroseis at all points along a source line, vibroseis buggies will travel on the perpendicular receiver (geophone) line to the next source line and begin vibrating. All project vehicles, excluding vibroseis buggies and vehicles deploying geophones will be confined to existing roads except where not practical. Agency approved avoidance criteria will apply to all off-road vehicle travel.

2.2.4 Receiver and Source Point Locations

Receiver and source points will be located using a global positioning system (GPS). Survey crews, consisting of approximately 15 to 20 people, will locate all receiver and source stations and will be responsible for routing access to receiver and source stations. This work will be accomplished on foot, on ATVs, and in vehicles driving along existing roads. The survey crew will be responsible for positioning receiver and sourcepoint stations avoiding all cultural and natural features, including houses, pipelines, wells and levees (Table 2).

TABLE 2

Standard setback distances for shotpoint placement with respect to natural and man-made features.

Cultural or Natural Features	Standard Shotpoint Setback Distance
Levees (all types)	500 feet from levee centerline
Aqueduct (Department of Water Resources)	Outside of right of way (Minimum 50 feet)
Ditches and canals (all types)	20 feet from canal or ditch centerline
Power lines and telephone lines	Greater that 1-1/2 times the length of the detonator wires. (Approx. 53 feet)
Oil and gas wells or pipelines	300 feet
Buried utilities (sewer, gas, and water lines)	100-200 feet
Buildings, water wells, other cultural features	500 feet

Note: OXY conducted testing in the prospect area during the East Elk Hills 3D Seismic Survey to determine the appropriate setback distances for the above cultural and natural features.

A layout and pick-up crew consisting of eight to ten people will place geophones along receiver lines and connect receiver stations with cables and signal boxes. A troubleshooting crew of four or five people will repair electrical problems throughout the life of the project. Two pickup crews consisting of eight to ten people will extract geophones, cables, and signal boxes. Pickup crews will be responsible for removing all receiver lines and trash (e.g., pinflags, flagging, and stakes). In addition, two people will operate the recorder truck and four or five people will work in loading zones and staging areas to coordinate movements, handle equipment, and separate trash. Vehicles and helicopters will be used to move all equipment depending on conditions present.

2.2.5 Shooting Technique and Progression

After receiver cables are placed in appropriate areas, two man shooting crews, using a shooting pack, will wire the explosives and inform the recording truck crew that they are in position and ready to shoot. After making sure that all geophones and required equipment along all lines are ready, the verbal command will be given by the recorder to ready the explosive for detonation (referred to by the field crew as getting it "hot"). The crew will ready the system for a radio signal that will detonate the explosive. The recorder, after receiving the ready tone via radio from the shooting crew, will transmit a radio signal to the shooting pack initiating a detonation.

Where shotholes are used, three or four shooting crews (two persons per crew) will detonate shotpoints along source lines one at a time. Each shooting crew will consist of a shooter and an assistant who detonates the shotpoint, removes shotpoint flagging and stakes and cuts and removes cap wires to below ground level. After shooting a source point, the shooting crew will move to the next source point and re-initiate the firing sequence. This progression will continue along source lines located between two receiver lines until all source lines have been completed.

2.2.6 Recording System

The recording system used by CGG will be the Sercel Recording System. This is a cable-based telemetry system consisting of a series of interconnected station units, seismic cables, and geophones. The station unit digitizes the seismic signal received from geophones and transmits the signals to the recording truck via cable. A small sealed solar battery is used to power the digitizing process for each station unit. Power (12 volts) is supplied down the insulated cable in cloudy or wet conditions.

2.2.7 Project Schedule

A network of source points will be established on private, state, and federal lands by drilling and placing explosives or establishing vibroseis points along source lines. Receiver cables will be deployed after authorization has been obtained to cross lands (scheduled for July 1999). Ten to twelve receiver lines must be laid out on the east end of the survey area to begin operations. Approximately every 3 days, the outer-most line will be picked up and re-deployed to the opposite end of the active area of the prospect. Timing of re-deployment will depend on equipment performance, line length, terrain, and weather conditions. Where lines extend over longer lengths or weather conditions are unfavorable it may take up to 5 days to complete survey activities. Ten to twelve receiver lines will be on the ground at all times during the survey. The receiver cable will move across the project area in this manner throughout the project. The project is expected to take six to eight months and be completed by February 2000.

In preparation for seismic survey activities, a biological preactivity survey, identification of known cultural resource sites, and a geodetic survey will be performed, some of which may be done concurrently. Biological resources will be surveyed and mitigation/avoidance procedures devised. All National Register of Historic Places listed and potentially eligible sites will be identified and avoidance procedures shall be devised. During this phase, the geodetic surveying will be performed to position the shotpoints, vibroseis locations, and geophone groups. Should it be determined that any endangered species or National Register listed or potentially eligible cultural sites would be disturbed by the seismic activities, avoidance measures will be incorporated into the geodetic survey. Geophone, shothole positioning, vibroseis locations, and vehicle access routes will be adjusted to accommodate endangered species, National Register listed or potentially eligible cultural sites, or other impediments as determined in the field by project geophysicists in consultation with on-site biologists, archaeologists, and OXY Environmental Services personnel. Project consulting archaeologist shall coordinate with the BLM archaeologist to ensure necessary assessment, mitigation and avoidance measures are implemented.

Following preliminary surveys, approximately 2,269 shotholes (10 % of the total number of source points off of OXY lands) will be drilled and loaded with explosive charges, and 20,422 vibroseis locations will be included in the project (90 % of the total number of source points off of OXY lands). The actual percentage split between shotholes/vibroseis points may be somewhat different due to terrain considerations or the presence of roadways. Depending on topography, endangered species, cultural resources, roads, well heads, pipelines, or other impediments, three types of drilling equipment will be used for this project. In areas where the topography or endangered species habitat impedes standard truck-mounted drilling units, it is planned that all terrain 4X4 buggy-mounted drilling rigs will be used to drill holes. Helicopter-transported drilling rigs will be available to drill shotholes that are inaccessible by ground vehicles due to the terrain, to protect endangered species habitat, or to avoid National Register listed or potentially eligible cultural sites.

Once shotholes are drilled and loaded with explosives, the data acquisition phase of the project will commence. During the data acquisition phase, geophones will be laid out and connected to centrally located, truck-mounted recording equipment. Geophones and cable will be dropped by helicopter and set into place by hand. As each explosive charge is detonated seismic waves reflected from subsurface geological features will be received by the geophones and electronically recorded. This procedure will be repeated for each of the shotpoints in the survey area.

2.3 ALTERNATIVE 3 (REDUCED AREA OPTION)

If BLM, DOE, and/or private land owners were to reject the OXY proposal to include portions of BLM and state administered lands or privately held lands in this project, OXY would continue with the project on a reduced scale within the OXY and Chevron USA owned properties. Should this option be selected, the seismic survey would yield lower quality seismic data, which would increase the risk of future exploration projects for petroleum resources at OXY. This option may result in increased habitat disturbance by increasing the risk of drilling non-productive wells in the future.

ALTERNATIVE 4 (DRILL ONLY/REDUCED SPACING OPTION)

Depending on the analysis of the data from the East Elk Hills 3D Seismic Survey, drill buggies may be employed at a reduced spacing (4 to 10 shotholes within a 110 foot interval) along the source lines. The estimated habitat disturbance for this alternative is the same as the proposed alternative. Should this option be selected, the seismic survey may yield higher quality seismic data which would reduced the risk of future exploration projects for petroleum resources at OXY. This option may result in decreased habitat disturbance by reducing the risk of drilling non-productive wells in the future.

3.0 AFFECTED ENVIRONMENT/ENVIRONMENTAL IMPACTS

This section presents only the environmental factors and the impacts which this project will have upon each of those indicators.

3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no impacts or change to the present environmental conditions at the project site or surrounding area.

3.2 THE PROPOSED ACTION, REDUCED AREA, AND THE DRILLING ONLY/REDUCED AREA OPTIONS

Except for areas that may be eliminated from the seismic survey, impacts for both the proposed action and the reduced area option would be the same. Impacts would be similar to those for other oil and gas activities on Elk Hills, adjacent private lands, and non-OXY government lands managed by BLM and DOE. Primary environmental impacts caused by the proposed action would be temporary surface disturbance associated with drilling of shotholes, vibroseis locations, and geophone placement, and vehicular ingress and egress from off-road drilling/vibroseis sites. Potential environmental impacts have been identified and discussed in sections 3.2.1 through 3.2.12.

3.2.1 Air Quality

Air quality in the Kern County region is considered marginal. The San Joaquin Valley Air Basin is designated as a nonattainment area for two of the six criteria air pollutants for which National Ambient Air Quality Standards (NAAQS) have been established, ozone and particulate matter less than 10 microns (PM10). All OXY petroleum production activities are governed by an extensive air pollutant permitting and monitoring program administered by the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) to meet requirements of the State Implementation Plan (SIP).

All emissions generated by seismic study activities would be of temporary duration and minimal in amount. No significant increase in atmospheric PM10 is anticipated as a result of increased vehicular travel over the existing road network and designated overland access/ egress routes. Vehicle traffic is expected to increase by an estimated 10-20 vehicles per day for a period of 3-5 months, which includes transportation of survey workers to and from the site. Gaseous emissions would include oxides of sulfur (SOx), oxides of nitrogen (NOx), carbon monoxide (CO), and volatile organic compounds (VOC) from internal combustion engines of drilling and transportation equipment. All subcontractor vehicles used on location will be required to comply with applicable air quality regulations. While some dust and exhaust plumes may be visible during project operations, no significantly measurable increase in air pollutants is anticipated. No air quality permits are required by SJVUAPCD for the proposed action.

3.2.2 Water Resources

All surface water in the region can be characterized as dry wash run-off from sparse rainfall in an arid environment. Total annual rainfall is approximately five to six inches per year, with about 70 percent of that occurring from December through March. Groundwater quality in the Buena Vista area varies considerably, with total dissolved solids (TDS) levels ranging from 50 parts per million (ppm) in perched groundwater to over 5,000-10,000 ppm in certain unconfined aquifers.

It is expected that the seismic survey will not negatively impact surface water resources, and all impacts would be minor and temporary in nature. Should spills of any hazardous material occur, containment and clean-up would be conducted in accordance with the OXY Spill Control and Countermeasures Plan.

3.2.3 Geology and Soils

The site is characterized by numerous small drainages and rough rolling hills with elevations ranging from 500 to 1,300 feet. Soils are primarily torriorthents and sandy-loam aridisols. The area of the proposed project is occupied by the Lower Sonoran Grassland community (Twisselmann, 1967) and naturally subject to wind and water erosion.

No impacts to the geologic structure within the project area are expected to result from the proposed action. Negative impacts to soil on the proposed project site would be of short-term duration and created principally from surface disturbance during drilling, vibroseis, and off-road driving, which may increase erosion slightly. Areas significantly impacted by the proposed action would be reclaimed and revegetated after completion of the seismic survey to prevent erosion.

3.2.4 Land Use

Elk Hills consists of 47,409 acres and has been extensively utilized for petroleum extraction and gas processing since the early 1900s. Oil production, gathering, and processing (and related support activities) currently are predominant land uses within the boundaries of the site. It is anticipated that OXY lands will continue to be used for petroleum extraction and processing for several decades. Land uses in the area surrounding Elk Hills follow the general patterns found throughout Kern County, which are dominated by agriculture, livestock grazing, and oil and gas extraction and production. Surface and mineral rights on lands surrounding the site are owned primarily by major oil companies or administered by the Federal Government. BLM lands within the project area also include livestock grazing leases that are located in the Oil Field Allotment, authorized for sheep grazing from December 1 to May 31.

Pipeline rights-of-way are prevalent throughout the project area, primarily for oil and gas transport by private companies. Adjacent land ownership in the project area is indicated in Figure 2.

The West Elk Hills 3D Seismic Survey would temporarily interfere with normal activities on portions of approximately 76 sections of OXY and adjacent BLM, DOE, and privately held lands and is consistent with existing land uses on and adjacent to Elk Hills. Pipeline companies will be consulted during the geodetic surveying to accurately locate existing pipelines and determine an adequate setback distance for project operations. The Buttonwillow-Kern County Airfield, may be used for helicopter operations. Impacts on the endangered species preserves will result from vehicle travel over designated routes, shot-hole drilling, vibroseis locations, and cable-laying operations as allowed by agencies or landowners. The BLM livestock grazing operations are not expected to be significantly affected by these activities. However, the BLM will notify the grazing operator prior to the seismic testing activities.

3.2.5 Waste Management

OXY policy requires all hazardous wastes be removed from the site, in accordance with all federal, state and local laws and regulations, by a state certified hazardous waste transporter to a state permitted hazardous waste disposal/recycling facility. Non-hazardous petroleum drilling wastes are land-farmed at a permitted Class II-I disposal facility located on Elk Hills. Solid sanitary wastes are collected in bins and transported to the local municipal landfill.

The largest quantity of wastes generated during the proposed project will be the non-hazardous drilling cuttings from shothole drilling operations, which will be discharged onto the surface. However, small amounts of potentially hazardous wastes such as solvents and lubricating oils may be generated during the project. Additionally, some small amounts of non-hazardous solid waste may be generated during the seismic project that would be temporarily stored on-site for subsequent removal to a municipal landfill. Disposal of all wastes generated during the proposed project will be done in accordance with all pertinent laws and regulations.

3.2.6 Ecology

Two natural vegetation communities are represented in the proposed seismic survey area: saltbush scrub and non-native annual grassland. The predominate vegetation association in the proposed seismic survey area is the Lower Sonoran grassland. Vegetation of the area is predominantly a sparse cover of red brome *(Bromus madritensis spp. rubens*) and red-stemmed filaree (*Erodium cicutarium*). Saltbush (*Atriplex polycarpa*) is present along slopes and in washes and drainages. Cheesebush (Hymenoclea salsola) is the most abundant shrub in washes and flat sandy areas on lower slopes. Other relatively common shrubs include bladderpod (Isomeris arborea) and matchweed (*Gutierrezia bracteata*). Only one federally listed plant species is known to exist on Elk Hills and surrounding land; Hoover's woolly star (*Eriastrum hooveri*). The BLM Sensitive Species Oil Neststraw, *Stylocline citroleum* is known to inhabit the project area.

Five endangered/threatened animal species are known to reside on Elk Hills and

surrounding lands; San Joaquin kit fox (*Vulpes macrotis mutica*), giant kangaroo rat (*Dipodomys ingens*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), San Joaquin antelope squirrel (*Ammospermophilus nelsonii*), and blunt-nosed leopard lizard (*Gambelia silus*). A more detailed discussion of both flora and fauna present in the project area may be found in the 1993 Supplemental Environmental Impact Statement for Petroleum Production at the Maximum Efficient Rate, Naval Petroleum Reserve No. 1 (SEIS).

Project activities will require both vehicle and foot travel in areas of undisturbed land which surround areas under varying levels of oil and gas development. Project impacts will consist of temporary habitat disturbances due to off-road vehicular travel. No permanent habitat loss is expected due to project activities, however, some short-term dislocations of some animal species due to shothole/vibroseis and geophone placement would take place in small, discontinuous patches. Impacts resulting from off-road vehicle travel will be minimized by the use of previously surveyed vehicle access routes under the supervision of qualified biological monitors. Further mitigative action will include revegetation of significantly disturbed areas.

Projected impacts of the proposed action on plant and animal communities and threatened and endangered species were analyzed in the Elk Hills SEIS Biological Assessment and will be supplemented by preactivity surveys (Appendix A). The extent of impacts and potential loss of habitat from the 3D seismic survey has been determined to be temporary and minor. There is a potential for adverse effects to threatened and endangered species from vehicle travel in the area, which may impact San Joaquin kit foxes, San Joaquin antelope squirrels, giant kangaroo rats, and blunt-nosed leopard lizards. Individual animals may be directly injured or killed by (1) vehicle strikes resulting from increased project related traffic and (2) through inadvertent entrapment in collapsed dens or burrows during use of off-road vehicles. However, preactivity surveys and on-site biological monitoring will be conducted to minimize this type of disturbance (Appendix A). All mitigation/avoidance measures as outlined in proposed action (Appendix A) will be adhered to during shothole drilling, cable layout, and other associated seismic survey activities. OXY has concluded the Section 2081 consultation with CDFG (Elk Hills SEIS) and will incorporate all compliance mitigation/avoidance measures into the final project design.

A combination of vibroseis and shothole drilling will be used along any given source line as the energy source. Several roads exist in the project area along which source points may be positioned. Because of this, OXY estimates that up to 10 % of the source points either will not be "vibed" at all, or may be placed on existing roads. If the West Elk Hills 3D seismic project is implemented as planned (70 % vibroseis/30 % shothole), a maximum of 290 acres of native habitat may be temporarily impacted by vibroseis pad compaction (15,884 vibroseis source points in native habitat x 110 ft. x 7.25/43,560 ft2 per acre) and an additional 125 acres of native habitat (6,807 shotpoint source points in native habitat x 110 x 7.25/43,560 ft2 per acre) by drilling activities. However, OXY anticipates repeating the vibroseis process more than one time at certain source points to collect data from adjacent points ("stacking") to avoid sensitive biological and cultural resources, oil wells and pipelines and/or vibe points that vibroseis buggies cannot reach because of topography. A total of 415 acres of native habitat is expected to be impacted temporarily by vibroseis

activity. It is estimated that truck mounted vibroseis/drilling buggies will temporarily impact 14 acres on DOE lands and 21.5 acres on BLM lands. An additional 51 acres of habitat within the low effort area may be disturbed by cross country travel across receiver lines (290.49 miles of receiver line x 20 % x 5,280 feet/mile x 7.25 feet wide/43,560 square feet/acre).

It is expected that geophone cables and seismic detectors will be delivered to the field via helicopter and deployed by hand. The use of ATVs for geophone deployment is possible where terrain permits. Because some portions of receiver (geophone) lines will be located in areas that contain numerous roads and two-track trails, no cross-country travel is anticipated for receiver line deployment trucks. However, vibroseis buggies may need to make a single pass along portions of receiver lines in order to travel between adjacent source lines. The use of a helicopter deploying cache bags for transportation of equipment to ground crews will greatly reduce cross-country vehicle travel.

3.2.7 Floodplain and Wetlands

The proposed 3-D seismic survey will take place in the Elk Hills drainage area. Specifically, Elk Hills Tributaries Nos.1 and 2, and McKittrick Valley Tributary No. 1 (see 100 Year Flood Plain Study of Naval Petroleum Reserve No. 1 and 2) would be within the proposed project area. Based on the 1996 Wetlands Delineation for Naval Petroleum Reserve No. 1 and the 1994 wetlands delineation for Naval Petroleum Reserve No. 2, no wetlands would be affected by the activities of this project.

Impacts to the floodplain will be limited to vehicle tracks and discharge of drilling cuttings on the surface. Drainages will not be altered or diverted for this project. Significant impacts will be reclaimed at the conclusion of the project.

3.2.8 Socioeconomic

Short-term subcontractors will be used to perform biological surveys and cultural resources identification/assessment/avoidance measures, seismic field work, and interpretation of seismic data. This will provide an incremental economic benefit to the local economy. Project management, environmental, and geological support services for this project will be supplied from existing OXY staff and long-term contractors/subcontractors, which will provide no incremental economic benefit. The proposed project will provide temporary employment to a small number of seismic subcontract employees (to drill shotholes, lay cable, etc.), one crew (3-4 people) of archeological investigators, and land surveyors. Local and regional economies would realize a short term, positive impact from expenditures for locally available services, equipment, and supplies.

Successful completion of this project is expected to increase Elk Hills recoverable reserves, and reduce risks and costs associated with further exploration and development in the area, which will have an positive effect on the local and national economies. The local economy may benefit through additional employment of workers in development, production, and refining of anticipated additional recoverable reserves.

3.2.9 Cultural Resources

The first European expedition into the San Joaquin Valley in 1772 was lead by Pedro Fages and his Spanish soldiers as they ventured through the Tejon Pass to the valley. Later in 1776 Francisco Garces visited the area. Exploitation of oil resources began in the 1860s. Initially an oil well pit was dug in 1863 near Reward to a depth of ten feet. By the 1890s, refining oil near McKittrick became commercially productive. In 1899 the discovery of oil in the Kern River Oilfield north of Bakersfield started the first major oil boom in the region. Cattle and sheep operations were introduced in the valley in the mid-1800s. Soon livestock became an important industry in the region. Agriculture by 1855 was on the increase as a major economic endeavor in valley. The presence of archaeological features and artifacts scattered on the valley landscape today attest to these past land uses.

The earliest inhabitants to the San Joaquin Valley, found in the vicinity of the ancient Tulare and Buena Vista Lakes region, dates back about 8,0000 to 12,0000 years ago to the Paleo-Indian Period. Ethnographically, the project area falls within the territory of the Southern Valley Yokuts. Some types of prehistoric sites from various periods that typically occur in this cultural region include food processing stations such as bedrock mortars and milling slicks, stone tool and lithic reduction scatters, ceremonial locals, and habitation sites.

Several large linear and block surveys, as well as small acreage surveys, have been conducted within the boundaries of the project in the past. As a result of these 40 archaeological surveys, a number of cultural resources, including historic and prehistoric archaeological sites, and historic features have been identified. A cultural resources record search was completed in April and June 1999 at the Southern San Joaquin Valley Information Center, California State University, Bakersfield for the proposed project area. The purpose of the record search was to identify previously recorded sites, National Register of Historic Places (NRHP) properties, and California Register sites located within the project Area of Potential Effect (APE).

As a result of the record search, 36 archaeological sites were identified to be within the project boundary but not necessarily within the project linear corridors for source and receiver lines or hereinafter referred to as the Area of Potential Effect (APE). Of these 36 sites, 28 are historic and eight are identified as prehistoric. An assessment of each site based on the site record review was completed by BLM in coordination with DOE. It was determined that nine sites out of the 36 sites were potentially eligible for the National Register of Historic Places as briefly listed in this paragraph. Seven prehistoric sites found potentially eligible include CA-KER-2049, 3169, 3289, 4521, 4522, 4523, and 5378. Fire affected rock is known to be present on five of these sites excluding 3289 and 5378. Two historic resources were determined potentially National Register eligible which include sites CA-KER-3135H and 4525H. Additionally, historic site CA-KER-2050H located within the project boundary was previously determined ineligible formally for the National Register in past consultation with the State Historic Preservation Officer (SHPO).

With implementation of mitigation measures to avoid all National Register listed or potentially eligible properties in the APE during the seismic project, this undertaking will result in no disturbance to historic properties. In the case of inadvertent discoveries during

the project, all work in the immediate area of the find will be suspended until an evaluation of significance is completed. Refer to mitigation measures in Appendix A. A final report including the results of site monitoring as well as the formal assessment by test excavations of three sites with fire affected rocks components will be submitted to BLM. Testing of three of the five (60%) fire hearth sites is considered a reasonable sample to make a determination of site National Register eligibility for the five similar sites in the project area. Refer to the Memorandum of Understanding (MOU) between Oxy, BLM, and DOE which addresses the cultural contextual study to be conducted in the Kern County oilfields.

BLM has initiated coordination with a number of Native Americans tribal councils, groups and individuals pursuant to the requirements in the National Historic Preservation Act and the American Indian Religious Freedom Act. To date (July 27, 1999) no comments have been received from the Native Americans pertinent to this undertaking. BLM is not aware of any cultural or religious Traditional Lifeway values that would be impacted by this specific project.

3.2.10 Visual Resources

The proposed seismic project will take place in an area that has been developed in the past and used for petroleum production for over 70 years. There are no vistas or small scale scenes in the area that can be deemed Avisual resources.@ Therefore, the proposed project will not adversely impact visual resources in the project area.

3.2.11 Noise

During shothole drilling operations of the proposed seismic survey, increased ambient noise levels will be experienced, however these disturbances will be less than standard oil field operations currently in progress. Detonation of explosive charges will be inaudible because they will occur 30 feet below the surface. Moreover, off-site perception of changes in ambient noise levels is not expected, given the remote location of the proposed action. No long-term noise effects will result from the proposed action, and no known sensitive receptors exist adjacent to the proposed project area.

3.2.12 Occupational Health and Safety

Negative impacts to occupational health and safety are not anticipated as a result of the proposed action. Potential exposure of workers to hazards from chemical agents, physical agents, or explosives, will be minimized using a combination of engineering controls, work practices and procedures as well as personal protective equipment. Training programs will be implemented to ensure that affected workers are knowledgeable of potential hazards and effectively able to implement available control measures. Workers will be protected from unexpected hazards arising during shothole drilling, cable-laying, and detonation of underground explosive charges by adherence to existing OXY Policy and Procedures, IAGC Safety Manual Requirements for Land Geophysical Operations, and occupational health and safety laws and regulations required by local, federal and state agencies.

3.3 CUMULATIVE IMPACTS

Cumulative impacts of completing the West Elk Hills 3D Seismic Survey are insignificant due to the short-term nature of the project and avoidance and mitigation measures (Appendix A) proposed to minimize and alleviate potential impacts. Other activities occurring in the vicinity of Elk Hills include intensive petroleum development on Federal and private properties, agricultural operations using extensive irrigation practices, livestock grazing, the California Aqueduct, and scattered residential/ commercial development. All of these activities are on a vastly larger scale with significantly greater long-term impacts than the proposed action. An increase in exploration and production of hydrocarbon reserves may occur on Elk Hills. However, this increase in activity is not anticipated to exceed the levels within Elk Hills for the 1997 SEIS. A map of the land use and ownership of lands adjacent to Elk Hills is located in Figure 2.

3.4 SUMMARY OF IMPACTS

A summary of impacts of the proposed action is provided in Table 3 for each impact area. Potential impacts to ecological and cultural resources, and land use are the primary areas of concern. OXY is committed to mitigation measures contained within this document to reduce or eliminate environmental impacts and risks for the proposed action.

TABLE 3

CRITICAL ELEMENT	IMPACTS OF ACTIONS	
	PROPOSED ACTION AND ALTERNATIVES #3 AND #4	NO ACTION
Air Quality	Small, short term increases in PM, SOx, NOx, CO, and VOC during construction; no permits required.	None
Water Resources	No ground water impacts; potential surface water impacts minimized by standard construction procedures. SPCC plan will govern potential spills.	None
Geology/Soil	Erosion/Compaction No impacts to geologic structures; possible minimal erosion of soils during construction; site reclamation after construction/abandonment would beneficially impact soils in the long term.	None
Land Use	None; area intensively utilized for petroleum production and related activities since early 1900's.	None

Waste Management	Non-hazardous drilling cuttings; small amounts of solid waste during drilling of shotholes and telemetry cable layout; minimal quantities of non-RCRA wastes (cleaning solvents, lubricants, etc.) during drilling operations.	None
Ecology	Site is sparsely vegetated with non-native annual grassland. Recent fires have burned most of the grasslands in the proposed project area. Shrubs are present mostly along drainages. A variety of animal species use the general area. Impacts to Federal and State listed species would be avoided. Potential take of threatened/endangered species due to vehicle strikes and the crushing of burrows/individual plants during off-road driving and drilling activities; impacts to these species and habitat will be minimized by adhering to mitigation measures stipulated in Appendix A.	None
Floodplain/ Wetlands	The proposed seismic survey will encompass two drainage systems, the McKittrick Valley and the North Elk Hills floodplains. Three stream tributaries would be within the proposed project are: McKittrick Valley Tributary No. 1, and North Elk Hills Tributaries No. 1 and 2. No wetlands will be impacted based upon the 1996 Wetlands Delineation, nor will any floodplains be impacted. **Check for other areas**	None
Socio-Economic	Small short term beneficial impacts due to increased temporary employment and expenditures with local businesses. Long term benefits to result from enhanced reservoir knowledge and reduced probability of drilling non-productive wells.	None
Cultural	With implementation of the mitigation measures to avoid all National Register listed and potentially eligible sites within the APE, the project will result in no impacts to historic properties. In the	None

	event of a late discovery of an archaeological site(s), all operations in the immediate area of the find will be suspended until site assessment is completed. Avoidance and monitoring conditions will be implemented as deemed necessary to avoid effects to historic properties. Authorization to recommence operations in the vicinity will be issued by the archaeologist (Appendix A.)	
Visual	None anticipated.	None
Noise	Minimal during drilling operations; subsurface detonations of explosive charges too deep to be audible; remote location has no nearby receptors.	None
Health/Safety	None anticipated.	None
Cumulative	None anticipated.	None

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5.0 REFERENCES

U.S. Department of Energy. July 1993. Supplemental Environmental Impact Statement, DOE/EIS-0158, Petroleum Production Operations at Maximum Efficient Rate. Naval Petroleum Reserve No. 1, (Elk Hills), Kern County, California.

Bechtel Petroleum Operations, Inc. Amended October 1995. NPR-1 Spill Prevention, Control, and Countermeasure Plan. Naval Petroleum Reserve No. 1 (Elk Hills), California.

U.S. Army Corps of Engineers, Sacramento District. November 1993. Approximate Floodplain Study, 100 Year Flood, for the Naval Petroleum Reserves No. 1 & No. 2, Kern County California. Naval Petroleum Reserve No. 1 (Elk Hills), California.

Fishman, R. H. January 1996. NPR-1 Wetlands Delineation for the Naval Petroleum Reserve No. 1, Elk Hills, Kern County California. Naval Petroleum Reserve No. 1 (Elk Hills), California.

Twisselman, 1967, A Flora of Kern County, California, Wasmann Journal of Biology, 25:1 395.

U.S. Department of Energy. October 1991. Biological Assessment of the Effects of Petroleum Production at Maximum Efficient Rate, Naval Petroleum reserve No. 1 (Elk Hills), Kern County California, On Threatened and Endangered Species. Naval Petroleum Reserve No. 1 (Elk Hills), California. Biological opinion rendered November 8, 1995.

U.S. Department of Energy, 1994, Wetlands Delineation for Naval Petroleum Reserve No.2 (Buena Vista Hills), Kern County, California.

U.S. Department of Energy. October 1997. Supplemental Environmental Impact Statement/Program Environmental Impact Report for the Sale of NPR-1, (Elk Hills), Kern County, CA. DOE/SEIS/PEIR: 0158-52. Naval Petroleum Reserves in California.

U.S. Department of the Interior, Bureau of Land management, Caliente Resource Area. December 1996. Caliente Resource Management Plan.

Occidental of Elk Hills, Inc., California Endangered Species Act Memorandum of Understanding and Take Authorization, regarding Naval Petroleum Reserve **B**1 (Elk Hills). Rendered December 1997.

APPENDIX A

MITIGATION MEASURES AND RESIDUAL IMPACTS

1.0 TAKE AVOIDANCE AND MITIGATION MEASURES

The Bureau of Land Management and Occidental of Elk Hills proposes to implement the following measures to avoid or minimize potential for take of listed species and to mitigate any negative project effects on listed species and their habitats.

1.1 TAKE AVOIDANCE

The following avoidance criteria table for listed wildlife resources and conditions will be followed by all 3D Seismic Survey project vehicles.

Table A-1.1
AVOIDANCE CRITERIA

Type of Sensitive Area	Radius of Buffer Zone in Feet
Occupied kit fox den	100 (200 BLM)
Known kit fox den	100
Known kit fox natal den	150
Occupied kit fox natal den	200 (300 BLM)
Potential kit fox den	50
Giant kangaroo rat burrows	50
San Joaquin antelope squirrel dens	30
Occupied blunt-nosed leopard lizard burrows	30
Badger dens	30
Burrowing owl burrows	50
Flat-Bottom Drainage	50

Note: The occupied and natal kit fox den buffer zones within the Elk Hills Conservation Area are 200 feet and 300 feet respectively.

1.2 BIOLOGICAL MITIGATION MEASURES

a) Prior to initiation of the project, a qualified wildlife biologist shall conduct an endangered species education program for all project personnel. Topics to be discussed during the briefing shall include: Occurrence and distribution of listed species in the project area, take avoidance measures being implemented during the project, reporting requirements if

incidental take occurs, and applicable definitions and prohibitions under the Endangered Species Act.

b) All activities that will result in permanent or temporary ground disturbances shall be preceded by a preactivity survey conducted by a qualified biologist. The biologist(s) shall identify and clearly mark all individuals, populations, and habitats of endangered and threatened species observed.

c) Biological monitors shall accompany seismic survey vehicles and crews throughout the project area at all times in which activities with potential to affect listed species are conducted. Biological monitors may conduct preactivity surveys, shall aid seismic crews in satisfying take avoidance criteria and implementing project mitigation measures, shall aid seismic crews in relocating vibroseis and geophone lines as necessary, shall observe and note all pertinent information concerning project effects on listed species, and shall assist in minimizing the adverse effects of project activities on endangered and threatened species.

d) Biological monitors are expressly empowered to order cessation of seismic activities if take avoidance and mitigation measures are significantly violated. Biological monitors or OXY-s environmental representative shall notify the USFWS prior to, or as soon as possible after biological compliance measures are significantly violated. At least one biological monitor shall accompany vibroseis crews while working within endangered species habitat. The biological monitor(s) and the USFWS shall not be held liable nor responsible for any losses nor inconveniences suffered by Occidental Petroleum and/or CGG Land Seismic, Inc., their employees, contractors or others caused by the terms of such action.

e) All known and potential San Joaquin kit fox dens, known giant kangaroo rat burrows, known San Joaquin antelope squirrel burrows, burrows inhabited by blunt-nosed leopard lizards, and all known Hoover's woolly-star colonies shall be protected by implementing the following procedures:

i) Exclusion zones shall be established by preactivity survey crews around all known and potential kit fox dens observed within the project area. The minimum exclusion zone radius shall be 50 feet for potential dens, 50 feet for atypical dens, 100 feet for known dens, 150 feet for known natal dens, and 300 feet for occupied natal dens. Applicant shall contact the U.S. Fish and Wildlife Service for direction if natal dens (whether occupied or not occupied) are encountered.

ii) All project vehicles shall observe access routes surveyed for sensitive wildlife resources, unless alterations to routes are expressly allowed by biological monitors.

iii) To minimize the effects of geophone deployment, the applicant shall use approved access routes to deploy all off-road geophone lines. No vehicles other than geophone deployment vehicles or ATVs shall be used to deploy geophones in endangered species habitats. During geophone deployment, work crews shall make every reasonable effort to avoid sensitive habitat such as dens and burrows.

iv) All project vehicles, excluding vibroseis buggies and vehicles deploying or

servicing geophones, shall be confined to existing roads except in prominently staked and/or flagged access routes. All observed endangered species habitats shall be flagged as necessary to alert project personnel to their presence. All project-related flagging shall be collected and removed after completion of the project.

v) Where feasible, OXY shall make every reasonable effort to prevent the collapse of dens and burrows by relocating source points to roads/disturbed areas or by using other means as determined to be appropriate. In some cases point sources may be "stacked" (several shots from the same location) to avoid extremely sensitive features or areas.

vi) Biological monitors shall keep an accurate tally of the number of kit fox dens and giant kangaroo rat burrows damaged, destroyed, or otherwise affected by project activities. Additionally, monitors shall estimate the number of small mammal burrows damaged, destroyed, or otherwise affected. Such tallies and estimates shall be totaled at the end of each work day to determine proximity to take limits and the need for subsequent project modifications. Total number of dens and burrows affected by the project shall be reported in the post-activity compliance report.

vii) If damage or destruction to a known San Joaquin kit fox den cannot be avoided during project activities, the USFWS Sacramento Field Office shall be contacted immediately for guidance. Potential kit fox dens that cannot be avoided may be excavated and back-filled pursuant to USFWS guidelines without prior notification, provided that excavation is approved and supervised by a biological monitor or other qualified biologist. Destruction of all kit fox dens shall be reported in the post-activity compliance report.

viii) If Hoover's woolly-star is known or thought to be in a project area, every reasonable effort shall be made to avoid them by relocating and/or reconfiguring the project. If it becomes necessary to locate a project in an area where Hoover's woolly-star is known or thought to be present, every reasonable effort shall be made to wait until after seed set before beginning ground disturbances. It will not be necessary to protect Hoover's woolly-star that has become reestablished in previously disturbed areas. On BLM lands, Stylocline citroluem will be avoided by relocating and/or reconfiguring the project to the greatest extent practicable during the growing season or by conducting surface disturbing activities after seed set.

f) A representative shall be appointed by the applicant who will be the contact source for any employee or contractor who inadvertently kills or injures a covered species or who finds a dead, injured, or entrapped individual. The representative will be identified during pre-performance educational briefing. The representative's name and telephone number shall be provided to the USFWS.

g) Any contractor, employee(s), or other personnel who inadvertently kills or injures a listed species shall immediately report the incident to their representative. The representative shall contact CDFG immediately in the case of a dead, injured, or entrapped species. CDFG contact for immediate assistance is State Dispatch at (916) 445-0045. State Dispatch will contact the local warden or biologist.

h) USFWS and CDFG shall be notified in writing within three (3) working days in the event of an accident death or injury of a San Joaquin kit fox, giant kangaroo rat, or blunt-nosed leopard lizard, or of the finding of any dead or injured kit fox, giant kangaroo rat, or leopard lizard during the proposed seismic survey. Notification shall include the date, time, and location of the incident or of the finding of a dead or injured animal, and any other pertinent information. The USFWS contact for this information is the Chief of the Division of Endangered Species, Sacramento Field Office, 3310 El Camino Avenue, Suite 130, Sacramento, CA 95821-6340, (916) 979-2725. The CDFG contact is Mr. Ron Schlorff, 1416 9th Street, Sacramento, CA 95814, (916) 654-4262. Any dead or injured kit fox, giant kangaroo rat, or blunt-nosed leopard lizard shall be turned over to the California Department of Fish and Game's Environmental Services Division, Fresno Regional Headquarters (209) 445-6152.

i) All seismic testing activities conducted in project areas known to be inhabited by Federal and State threatened and endangered species shall be confined to daylight hours, extending from sunrise to sunset.

j) To prevent inadvertent entrapment of covered vertebrates, all open shot holes, steep-walled holes, or trenches more than 2 feet deep shall be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures listed above must be followed:

i) All spills of hazardous materials shall be cleaned up immediately in accordance with the Occidental of Elk Hills Spill Prevention, Control, and Countermeasures Plan.

ii) Pets shall be prohibited at project sites.

iii) Firearms shall be prohibited at project sites.

iv) All food-related trash, such as wrappers, cans, bottles, bags, and food scraps shall be disposed of daily in containers with secure covers and regularly removed from project sites.

v) Use of rodenticides and herbicides in project areas shall be restricted. Any compounds used will be applied in accordance with label directions and other restrictions mandated by U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the Service. Only zinc phosphate shall be used if rodent control is necessary.

vi) All project-related vehicles shall observe a speed limit of 20 mph or less on all off-road routes that traverse endangered species habitat, except as posted on State and County highway/roads or paved facility roads.

vii) Travel corridors within endangered/threatened species habitat shall be limited in width to 25 feet (12.5 feet on either side of the centerline). Off-road travel corridors shall

be reduced in width, where possible, to avoid endangered species habitats such as occupied kit fox dens or giant kangaroo rat burrows. Foot travel shall be utilized where corridor criteria cannot be met.

viii) Off-road driving is prohibited at project sites, except within approved access routes that have been previously surveyed.

ix) Appropriate measures shall be undertaken to prevent unauthorized vehicle entry to off-road survey routes in sensitive habitat areas. Signing will be the preferred method to discourage use.

x) Project vehicles shall be confined to existing primary or secondary roads or to specifically delineated project sites (i.e., areas that have been surveyed and described in existing documentation). Otherwise, off-road vehicle travel is not permitted.

xi) All vehicle travel on areas of cryptogamic soils shall be avoided to the greatest extent practicable. Geophones will be hand-carried and set in place in areas with cryptogamic soils. If necessary, biological monitors shall be on site during geophone placement to identify areas to avoid.

xii) Upon completion of the project, all areas that are significantly disturbed shall be revegetated, and re-contoured if necessary, to promote restoration of the area to pre-project conditions.

xiii) Within 45 days of completion of the project, Occidental of Elk Hills shall submit to USFWS, CDFG, BLM, and DOE a post-activity compliance report that details the following information: dates that seismic recordings occurred, pertinent data concerning Occidental's success in meeting project take avoidance and mitigation measures, known project effects (if any) on San Joaquin kit foxes, giant kangaroo rats, blunt-nosed leopard lizards, and San Joaquin antelope squirrels (including the number of dens and burrows of listed species damaged or destroyed), occurrences of incidental take of listed species, an assessment of the extent and severity of project impacts on all sensitive wildlife habitats, a summary of habitat rehabilitation plans, and any other pertinent information.

xiv) Selected geophone and source lines will be marked on BLM, DOE, and OXY lands to provide line location for post-project monitoring.

xv) If requested, upon completion of the project, Occidental shall accompany USFWS, BLM and DOE personnel on an on-site inspection of the seismic survey area to determine project impacts to endangered species and their habitats.

1.3 CULTURAL RESOURCES MITIGATION MEASURES

For cultural work within the project boundary, an archaeologists who meets or exceeds the Secretary of the Interior=s Standards shall be used to complete the necessary tasks below. Refer to Memorandum of Understanding (MOU) between OXY, BLM, and DOE as well as BLM/SHPO correspondence for this project (contextual study approach for Kern County oilfields).

1. A record search for the entire project area will be completed (excluding old NPR-1 lands). This will include BLM land, DOE NPR-2 land and private land.

2. Flag for avoidance any sites that are eligible/listed and potentially eligible for the National Register of Historic Places (determined by BLM in coordination with DOE).

3. In the event of a late discovery of an archaeological site(s), all operations in the immediate area of the find will be suspended until site assessment is completed. Avoidance and monitoring conditions will be implemented as deemed necessary to avoid effects to historic properties (meets National Register significance criteria). Authorization to recommence operations in the vicinity will be issued by the archaeologist.

4. Test units will be completed on three sites with fire affected rock components (potential fire hearth sites) that occur within the project area to determine significance applicable to National Register criteria (36 CFR, Part 60.4). A report will be submitted to BLM documenting the results of site testing and site monitoring compliance.

2.0 RESIDUAL IMPACTS AFTER MITIGATION MEASURES

There will be short term effects to fauna and flora as both components are temporarily affected.

2.1 WILDLIFE

Nocturnal species should experience few direct impacts as a consequence of the activities associated with the seismic survey. Diurnal animals may have foraging and reproductive activities disrupted by increased activity associated with the seismic survey. There is a low probability of disrupting reproductive efforts of raptors and other animals which tend to breed early in the year simply because such species occupy available habitats in low densities. Because the seismic survey will proceed rapidly, the effect of increased human traffic on wildlife should be localized and minor. The seismic survey will result in numerous small, temporarily disturbed areas at shothole locations and along access routes. Overall impacts of such disturbances on wildlife is unknown but will probably vary from one to several years depending on the site.

2.2 BOTANY

Impacts to botanical resources have been presented above in the Environmental Consequences of the Proposed Action section. A temporary reduction in plant life will occur as the off-road travel routes are revegetating from natural sources adjacent to the source lines and during the time of artificial revegetation of significant surface disturbances that may result from the project.

2.3 CULTURAL RESOURCES

No impacts to National Register properties or potentially eligible sites as they will be avoided.

2.4 RANGE

No grazing users should be affected by any seismic survey activity and the project permitting agent will coordinate any grazing leases in the project area. Temporary disturbances to grasses and forbs that serve as livestock forage.

2.5 WILDERNESS

None.

2.6 RECREATION

None.

2.7 VISUAL RESOURCES

None.

2.8 WILDERNESS

None as no "wilderness" areas have been designated.